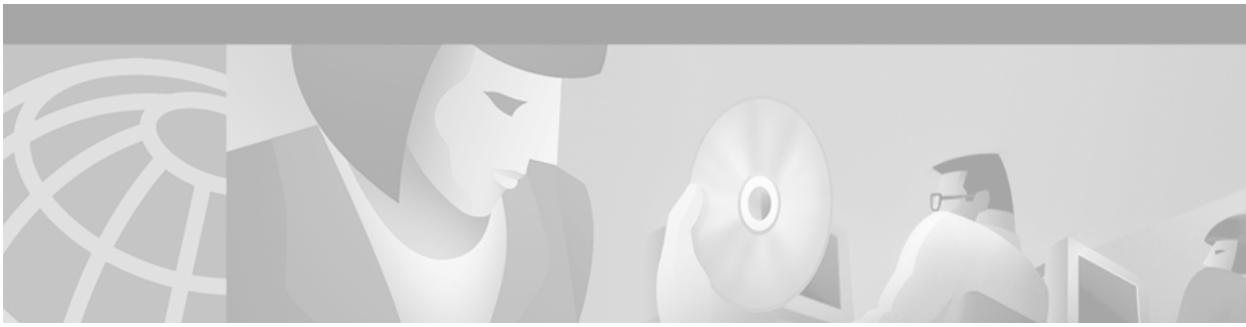

MPLS Traffic Engineering (TE)—IP Explicit Address Exclusion

This feature modules describes MPLS traffic engineering IP explicit address exclusion for Release 12.0(14)ST1.

This document contains the following sections:

- Feature Overview
- Supported Platforms
- Supported Standards, MIBs, and RFCs
- Prerequisites
- Configuration Tasks
- Configuration Example
- Command Reference
- Glossary

Feature Overview

The MPLS traffic engineering Internet Protocol (IP) explicit address exclusion feature provides a means to exclude a link or node from the path for an MPLS traffic engineering label-switched path (LSP).

The feature is accessible via the **ip explicit-path** command that allows you to create an IP explicit path and enter a configuration submode for specifying the path. The feature adds to the submode commands the **exclude-address** command for specifying addresses to exclude from the path.

If the exclude-address for an MPLS traffic engineering LSP identifies a flooded link, the constraint-based shortest path first (CSPF) routing algorithm doesn't consider that link when computing paths for the LSP. If the exclude-address specifies a flooded MPLS traffic engineering router ID, the CSPF routing algorithm doesn't allow paths for the LSP to traverse the node identified by the router ID.

Benefits

This feature is useful when you want MPLS traffic engineering LSPs to avoid certain links and nodes.

Restrictions

MPLS traffic engineering will accept an IP explicit path comprised of either all exclude-addresses configured by the **exclude-address** command or all include-addresses configured by the **next-address**, but not a combination of both.

Related Features and Technologies

The IP explicit address exclusion feature is related to

- MPLS traffic engineering
- Cisco Express Forwarding (CEF)

Related Documents

Refer to the Cisco IOS Release 12.0(10)ST *MPLS Traffic Engineering and Enhancements* manual.

Supported Platforms

MPLS traffic engineering IP explicit address exclusion is supported on the following platforms:

- Cisco 7200 series (including the Cisco 7202, Cisco 7204, Cisco 7204 VXR, Cisco 7206, and Cisco 7206 VXR)
- Cisco 7500 series (including the Cisco 7505, Cisco 7507, Cisco 7513, and Cisco 7576)
- Cisco GSR 12000 series (including the Cisco 12008, Cisco 12012, and Cisco 12016)

Supported Standards, MIBs, and RFCs

Standards

This feature does not support any new or modified standards.

MIBs

This feature does not support any new or modified MIBs.

To obtain lists of MIBs supported by platform and Cisco IOS release and to download MIB modules, go to the Cisco MIB web site on Cisco Connection Online (CCO) at http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml.

RFCs

This feature does not support any new or modified RFCs.

Prerequisites

Your network must support the following Cisco IOS features in order to support IP explicit address exclusion:

- MPLS
- IP Cisco Express Forwarding (CEF)
- Intermediate System-to-Intermediate System (IS-IS) or Open Shortest Path First (OSPF)

Configuration Tasks

To enable IP explicit address exclusion for use with traffic engineering tunnels, perform the following steps:

- Enter the **ip explicit-path** command to configure an explicit path and enter the **exclude-address** command to specify the addresses to be excluded from the path.
- Configure an MPLS traffic engineering tunnel to use the explicit path as one of its path options.

Configuring IP Explicit Address Exclusion

	Command	Purpose
Step 1	`Router# conf terminal`	Accesses router configuration mode.
Step 2	`Router(config)# ip explicit-path {name word|identifier number} [{enable|disable}]`	Specifies the name or number of the explicit path, and enables the path.
Step 3	`Router(cfg-ip-expl-path)# exclude-address A.B.C.D.`	Excludes the specified link or node from consideration by the constraint-based SPF. *A.B.C.D.* is a link address or the router_id for a node.
Step 4	`Router(config–if)# exit`	Exits from explicit-path configuration mode.

Configuring an MPLS Traffic Engineering Tunnel

To configure an MPLS traffic engineering tunnel, perform these steps in interface configuration mode.

	Command	Purpose
Step 1	`Router(config)# interface tunnel`	Configures an interface type and enters interface configuration mode.
Step 2	`Router(config)# ip unnumbered loopback0`	Gives the tunnel interface an IP address. An MPLS traffic engineering tunnel interface should be unnumbered because it represents a unidirectional link.
Step 3	`Router(config-if)# tunnel destination` *A.B.C.D*	Specifies the destination for a tunnel. The destination of the tunnel must be the MPLS traffic engineering router ID of the destination device.
Step 4	`Router(config-if)# tunnel mode mpls traffic-eng`	Sets the tunnel encapsulation mode to MPLS traffic engineering.
Step 5	`Router(config-if)# tunnel mpls traffic-eng bandwidth` *bandwidth*	Configures the bandwidth for the MPLS traffic engineering tunnel.
Step 6	`Router(config-if)# tunnel mpls traffic-eng path-option` *number* {**dynamic** | **explicit** {**name** *path-name* | **ID** *path-number*}} [**lockdown**]	Configures the tunnel to use a named IP explicit path or a path dynamically calculated from the traffic engineering topology database. A dynamic path is used if an explicit path is currently unavailable.

Note To configure a path option that specifies an exclude address in Step 6, specify the **explicit** keyword (not the **dynamic** keyword) and specify an IP explicit path configured according to the steps in "Configuring IP Explicit Address Exclusion."

Verifying IP Explicit Address Exclusion

Command	Purpose
`Router# show ip explicit-path`	Shows information about configured IP explicit paths.
`Router# show mpls traffic eng tunnels`	Shows information about tunnels, including the current tunnel path if a tunnel is operational. By viewing the command output, you can determine the path that was used to build a tunnel. If you entered the **exclude-address** command, the specified link or node should not be listed.

Configuration Example

This example illustrates how to configure an MPLS traffic engineering tunnel with two path options: a preferred explicit path with an exclude-address and a backup dynamic path.

First, configure the IP explicit path named “OmitR12” which excludes the router with router ID 12.12.12.12

```
router(config)# ip explicit-path name OmitR12
router(cfg-ip-expl-path)# exc
router(cfg-ip-expl-path)# exclude-address 12.12.12.12
Explicit Path name OmitR12:
    1: exclude-address 12.12.12.12
router(cfg-ip-expl-path)# end
```

To verify the configuration of the explicit path, use the **show ip explicit-path** command:

```
router# show ip explicit-paths name OmitR12
PATH OmitR12 (loose source route, path complete, generation 3)
    1: exclude-address 12.12.12.12
router#
```

Note The person performing the configuration must know the router IDs for LSRs (nodes) in the network; in this example, that 12.12.12.12 is a router ID. Otherwise, it will not be apparent whether the specified address is the IP address of a link or a router ID.

Next, configure Tunnel11 with its two options, where the preferred path option is the ip explicit path “OmitR2”:

```
router(config)# interface Tunnel11
router(config-if)# ip unnumbered Loopback0
router(config-if)# tunnel destination 11.11.11.11
router(config-if)# tunnel mode mpls traffic-eng
router(config-if)# tunnel mpls traffic-eng path-option 1 explicit name OmitR12
router(config-if)# tunnel mpls traffic-eng path-option 2 dynamic
```

Note There are additional commands for configuring properties for traffic engineering tunnels such as bandwidth, priority, and so forth. For descriptions of those commands, refer to the *MPLS Traffic Engineering and Enhancements* manual.

Command Reference

This section documents the **exclude-address** command. All other commands used with this feature are documented in the Cisco IOS Release 12.0 and Release 12.1 command reference publications.

exclude-address

An IP explicit path is a list of IP addresses, each representing a node or link in the explicit path. To exclude an address from an IP explicit path, use the **exclude-address** command after entering explicit path configuration mode via the **ip-explicit path** command. To remove an address exclusion from an IP explicit path use the **no index** command.

exclude-address *A.B.C.D*

no index *number*

Syntax Description

A.B.C.D.	Excludes an address from subsequent partial path segments. You can enter the IP address of a link or the router ID of a node.
number	Removes the specified address exclusion from an IP explicit path.

Defaults

Addresses are not excluded from an IP explicit path unless explicitly excluded by the **exclude-address** command.

Command Modes

Subcommand

Command History

Release	Modification
12.0(14)S	This command was introduced.

Usage Guidelines

If you enter the **exclude-address** command and specify the IP address of a link, the constraint-based SPF routine does not consider that link when it sets up MPLS traffic engineering paths. If the excluded address is a flooded MPLS traffic engineering router ID, the constraint-based SPF routine does not consider that entire node. The person performing the configuration must know the router IDs of the routers because it will not be apparent whether the specified number is for a link or for a node.

Note MPLS traffic engineering will accept an IP explicit path comprised of either all exclude-addresses configured by the **exclude-address** command or all include-addresses configured by the **next-address**, but not a combination of both.

Examples

The following example shows how to create a IP explicit path with identifier 500 and enter the explicit path subcommand mode to configure the path:

```
Router(config)# ip explicit-path identifier 500
Router(config-ip-expl-path)#
```

The following continues by showing how to exclude IP addresses 10.0.0.125 and 10.0.0.135 from IP explicit path 500:

```
Router(config-ip-expl-path)# exclude-address 10.0.0.125
Explicit Path identifier 500:
    1: exclude-address 10.0.0.125
Router(config-ip-expl-path)# exclude-address 10.0.0.135
Explicit Path identifier 500:
    1: exclude-address 10.0.0.125
    2: exclude-address 10.0.0.135
Router(config-ip-expl-path)# end
Router#
```

To remove IP address 10.0.0.125 from the excluded addresses for explicit path 500, use the following commands:

```
Router(config)# ip explicit-path identifier 500
Router(cfg-ip-expl-path)# no index 1
Explicit Path identifier 500:
    2: exclude-address 10.0.0.135
Router(cfg-ip-expl-path)# end
```

Related Commands

Command	Description
ip explicit-path	Enters the subcommand mode for Internet protocol (IP) explicit paths and creates or modifies a specified path.

Glossary

CEF—Cisco express forwarding. A means for accelerating the forwarding of packets within a router, by storing route lookup information in several data structures instead of in a route cache.

IP explicit path—A list of IP addresses, each representing a node or link in the explicit path.

link—Network communications channel consisting of a circuit or transmission path and all related equipment between a sender and a receiver. Sometimes referred to as a line or a transmission link.

MPLS—Multiprotocol label switching (formerly known as tag switching). A method for directing packets primarily through Layer 2 switching rather than Layer 3 routing. In MPLS, packets are assigned short fixed-length labels at the ingress to an MPLS cloud by using the concept of forwarding equivalence classes. Within the MPLS domain, the labels are used to make forwarding decisions mostly without recourse to the original packet headers.

node—Endpoint of a network connection or a junction common to two or more lines in a network. Nodes can be interconnected by links, and serve as control points in the network.